PATENT ABSTRACTS OF JAPAN

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(54) NONAQUEOUS ELECTROLYTE BATTERY VESSEL

(57)Abstract:
PROBLEM TO BE SOLVED: To prevent the reduction of rechargeability by generation of distortion accompanying the expansion and contraction of an electrode in charge and discharge by forming a vessel by use of a multiple structure having has interrupting property and rigidityand making it hold hydruscesility and gas absorbability.
SOLUTION: A vessel for a battery 1 is formed of a multiple structure having gas interrupting property and rigidity. The multiple structure is formed of a facing can 3 consisting of a rigid material having sealing propertyand an inner plastic vessel to be arranged within the facing can 2. The facing can 2 can be made by use of steel or a lightweight metal such as aluminum or titanium which has necessary strength and sealing property as battery vessel. The inner plastic vessel is formed of a box or packing bag 3 consisting of a single-layer or multilayer plastic material. A bygroscopic agent and a gas absorbent are preferably kneaded to the material of the inner plastic vessel to make the inner plastic vessel bygroscopic and gas absorbable. By setting the inner plastic vessel into a bellows structurethe movement of an electrode plate by charge and discharge of a battery can be absorbed.

CLAIMS

[Claim(s)]
[Claim 1]A container for nonaqueous electrolyte batteries which consists of multiple

structure which has gas cutoff nature and rigidity.
[Claim 2]The container for nonaqueous electrolyte batteries according to claim 1 having hygroscopicity and/or gas absorption nature.
[Claim 3]The container for nonaqueous electrolyte batteries according to claim 1 or 2wherein multiple structure consists of an armor can which consists of an existing sealing rigid materialand an interior plastic container arranged inside this armor can.
[Claim 4]The container for nonaqueous electrolyte batteries according to claim 3wherein an interior plastic container consists of a boxpackaging bagsor such combination.
[Claim 5]The container for nonaqueous electrolyte batteries according to claim 3 or 4wherein an interior plastic container has multilayer structure.
[Claim 6]The container for nonaqueous electrolyte batteries according to claim 5wherein multilayer structure contains a gas-barrier-property resin layer of at least one layer.
[Claim 7]A container for nonaqueous electrolyte batteries given in any 1 paragraph of claims 3-6wherein an interior plastic container is a packaging bag made from a plastic laminate film.
[Claim 8]The container for nonaqueous electrolyte batteries according to claim 7wherein a plastic laminate film laminates a plastic film of at least one layer on the both sides by making a metallic foil into an interlayer.
[Claim 9]A container for nonaqueous electrolyte batteries given in any 1 paragraph of claims 3-8 being what has a plastic layer in which an interior plastic container contains a desiccant and/or a gas absorbent.
[Claim 10]A container for nonaqueous electrolyte batteries given in any 1 paragraph of claims 3-9 being what has a plastic layer which can heat seal an interior plastic container.
[Claim 11]A container for nonaqueous electrolyte batteries given in any 1 paragraph of claims 3-10wherein an interior plastic container is what has bellows structure.
[Claim 12]A container for nonaqueous electrolyte batteries given in any 1 paragraph of claims 3-11 providing a desiccant and/or a gas absorbent stowage between an armor can and an interior plastic container.
[Claim 13]A container for nonaqueous electrolyte batteries given in any 1 paragraph of claims 3-12 providing a pressing member which presses an interior plastic container to an inner direction between an armor can and an interior plastic container.
[Claim 14]A container for nonaqueous electrolyte batteries given in any 1 paragraph of claims 3-13wherein an armor can is constituted with lightweight metalssuch as aluminumtitaniumor these alloys.
[Claim 15]A container for nonaqueous electrolyte batteries given in any 1 paragraph of claims 3-13wherein an armor can is constituted with a plastic material.
[Claim 16]The container for nonaqueous electrolyte batteries according to claim 1 or 2 consisting of a layered product characterized by comprising the following.
An outer layer where multiple structure consists of rigid materials at least.
A plastic layer containing a moisture absorption material and/or a gas absorbent.

[Claim 17]A container for nonaqueous electrolyte batteries given in any 1 paragraph of claims 1-16wherein memberssuch as a cap which accompanies a spout for electrode terminal immobilizationa spout for safety valve immobilizationand these which are heat sealed by multiple structureconsist of a plastic containing a desiccant and/or a gas

absorbent.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]This invention relates to the high tension used suitably for the object for stationary energy storagean electromobileetc.and the container for nonaqueous electrolyte batteries with which large scale is acquired.
[0002]
[Description of the Prior Art]Lithiuma lithium alloyor the substance in which a dope and a dedope of a lithium ion like a carbon material are possible is used as a negative pole electrode in recent years as a cell by which high tension and high energy density are obtainedResearch of the rechargeable lithium-ion battery which is a nonaqueous electrolyte battery which uses lithium multiple oxidessuch as a lithium cobalt multiple oxidefor a positive electrodeand development are performed.
[0003]The cylindrical battery which stored the spiral electrode layered product around which the structure of this cell winds a plate-like electrode in the cylindrical metal deep-drawing caseor the flat square-shaped cell which stored the flat tip-like electrode layered product which laminates a plate-like electrode in the corniform metal deep-drawing case is almost the case.
It was small and was a thing of small capacity convenient to carry.

[0004]In a rechargeable lithium-ion batteryif moisture exists also in a minute amounta negative pole electrode will react to waterhydrogen will be generatedand there is a fault of generating heat. An electrolysis solution may decompose at the time of use of a celland corrosive gassuch as hydrogen fluoride gasmay be emitted. Since expansion of an electrode and contraction arise in the case of discharge and chargethe distortion within the container which stores a cell occurs and there is a problem that manufacture of a mass large-sized cell is difficult.
[0005]
[Problem(s) to be Solved by the Invention]Thereforewhile this invention can cancel the problem of these conventional technologies and being able to absorb a little the moisture and the gas emitted in a cellThe fall of the rechargeability by generating of the distortion accompanying expansion of the electrode in the case of discharge and charge and contraction is preventedand it aims at providing the container for cells which enables manufacture of nonaqueous electrolyte batteriessuch as a mass large-sized rechargeable lithium-ion battery.
[0006]
[Means for Solving the Problem]In this inventionin order to solve an aforementioned problemthe following composition is taken.
1. Container for nonaqueous electrolyte batteries which consists of multiple structure which has gas cutoff nature and rigidity.
2. Container for nonaqueous electrolyte batteries given in 1 having hygroscopicity and/or gas absorption nature.

3. 1wherein multiple structure consists of armor can which consists of existing sealing rigid materialand interior plastic container arranged inside this armor canor container for nonaqueous electrolyte batteries given in 2.
4. Container for nonaqueous electrolyte batteries given in 3wherein interior plastic container consists of boxpackaging bagsor such combination.
5. 3wherein interior plastic container has multilayer structureor container for nonaqueous electrolyte batteries given in 4.
6. Container for nonaqueous electrolyte batteries given in 5wherein multilayer structure contains gas-barrier-property resin layer of at least one layer.
7. Container for nonaqueous electrolyte batteries given in any 1 paragraph of 3-6wherein interior plastic container is packaging bag made from plastic laminate film.
8. Container for nonaqueous electrolyte batteries given in 7wherein plastic laminate film laminates plastic film of at least one layer on the both sides by making metallic foil into interlayer.
9. Container for nonaqueous electrolyte batteries given in any 1 paragraph of 3-8 being what has plastic layer in which interior plastic container contains desiccant and/or gas absorbent.
10. A container for nonaqueous electrolyte batteries given in any 1 paragraph of 3-9 being what has a plastic layer which can heat seal an interior plastic container.
11. A container for nonaqueous electrolyte batteries given in any 1 paragraph of 3-10wherein an interior plastic container is what has bellows structure.
12. A container for nonaqueous electrolyte batteries given in any 1 paragraph of 3-11 providing a desiccant and/or a gas absorbent stowage between an armor can and an interior plastic container.
13. A container for nonaqueous electrolyte batteries given in any 1 paragraph of 3-12 providing a pressing member which presses an interior plastic container to an inner direction between an armor can and an interior plastic container.
14. A container for nonaqueous electrolyte batteries given in any 1 paragraph of 3-13wherein an armor can is constituted with lightweight metalssuch as aluminumtitaniumor these alloys.
15. A container for nonaqueous electrolyte batteries given in any 1 paragraph of 3-13wherein an armor can is constituted with a plastic material.
16. 1 consisting of a layered product containing an outer layer where multiple structure consists of rigid materials at leastand a plastic layer containing a moisture absorption material and/or a gas absorbentor a container for nonaqueous electrolyte batteries given in 2.
17. A container for nonaqueous electrolyte batteries given in any 1 paragraph of 1-16wherein memberssuch as a cap which accompanies a spout for electrode terminal immobilizationa spout for safety valve immobilizationand these which are heat sealed by multiple structureconsist of a plastic containing a desiccant and/or a gas absorbent.
[0007]
[Embodiment of the Invention]The multiple structure which has gas cutoff nature and rigidity constitutes the container for nonaqueous electrolyte batteries from this invention. The armor can which consists of an existing sealing rigid material so that drawing 1 may seeand the interior plastic container arranged inside this armor can can constitute this multiple structure. The layered product containing the outer layer which consists multiple

structure of rigid materials at least so that drawing 8 may seeand the plastic layer containing a moisture absorption material and/or a gas absorbent may constitute.
[0008]As a material which constitutes the armor can of the container for nonaqueous electrolyte batteries from this inventionthe rigid material provided with required intensity and sealing performance is used as a battery container. As an example of such a rigid materialthe various surface treatment raw materials or the various resin coating raw materials of lightweight metal; these metalsuch as alloy; aluminumsuch as chromium of various metal materialsfor examplesteeland steel and nickeltitaniumor these alloysare mentioned.
[0009]Polyethylene system resinsuch as high density polyethylenelow density polyethyleneand linear low density polyethyleneVarious polyolefinessuch as a polypropylene regin and cyclic polyolefinComposite materialssuch as fiber reinforced plastics which combined various plastic materialsuch as nylonpolyesterand crystalline polyesterand these plastic materialglass fibercarbon fiberetc.can also be used as a rigid material which constitutes an armor can. Since it becomes possible to improve the heat dissipation nature of a cell while acquiring required intensity and sealing performancewhen lightweight metalssuch as aluminumtitaniumor these alloysare usedand to carry out the weight saving of the cell moreover also in these rigid materialsit is desirable. In using a plastic material for an armor cangradual release of gassuch as hydrogen which is generated in very small quantities by repetition of charge and discharge in addition to a weight savingis possibleand there is an advantage from a point of reservation of safety.
[0010]The boxes or packaging bags which consist of a monolayer or multilayer plastic materialor such combination can constitute the interior plastic container arranged inside the armor can which consists of rigid materials. The box used as an interior plastic container can be manufactured with the usual forming processessuch as vacuum forminga vacuum and pressure formingan injection moldingblow moldingor these combinationand there is no restriction in the forming process. Although there is no restriction in particular in the plastic material to be used and each thermoplastics usually used for manufacture of a plastic container can be usedAs desirable plastic materialfor example Polyolefinessuch as high density polyethylene and polypropylene. Polyestersuch as polycarbonatepolyvinyl chloridea polyvinylidene chloridepolyamidepolyacrylonitrilean ethylene-vinyl acetate copolymer saponification thingand polyethylene terephthalateetc. are mentioned.
[0011]Although the box used as an interior plastic container may be constituted as what has layer structure with these plastic materialThe principal member layer which consists of these plastic material in order to improve gas barrier propertyorganic solvent barrier naturemoisture barrier natureetc.Polyamidesuch as an ethylene-vinylacetate copolymer saponification thingnylon 6and Nylon 66. It is preferred to constitute as what has the multilayer structure containing the gas-barrier-property resin layer of at least one layer which consists of polyacrylonitrile and its copolymera polyvinylidene chloride and its copolymerand cyclic polyolefin. Heat-sealing nature can also be given to an interior plastic container by using heat-sealing nature resin for a inner layer and/or an outer layer.
[0012]In order to give hygroscopicity and/or gas absorption nature to an interior plastic containerit may be made to scour a desiccant and/or a gas absorbent in the plastic material which constitutes a container. As these desiccants and/or a gas absorbentFor

examplethe sintered compact containing metalsuch as metal salt of molecular sievessuch as zeolite of silica gelnatureor compositionactivated carbonand stearic acidnature or composite hydrotalcitesnickel with a hydrogen absorption functionand palladiumor themetc. are raised.
[0013]As a lid of an interior plastic containerthe same plastic material as a package body is usedWhat unifiedfor example by the injection molding and fabricated the spouts which connect an electrode terminala safety valveetc. is usedAfter storing an electrode in an interior plastic containerit is preferred to constitute so that the seal of this lid may be carried out to the flange of the main part of an interior plastic container with heat sealingan ultrasonic sealetc. When such a lid is usedit becomes possible to improve the sealing performance of the container for cells much more.
[0014]The packaging bag made from a plastic laminate film can constitute again the interior plastic container arranged inside an armor can from this invention. As a material suitable for the plastics base material film which constitutes the plastic laminate film used as this packaging bagFor examplecrystalline polypropylenea crystalline propylene-ethylenic copolymerThe crystalline polybutene 1the crystalline poly 4-methylpentene-1low -Inside - or high density polyethylenean ethylene-vinylacetate copolymer (EVA)Polyolefinessuch as an ethylene-ethyl acrylate copolymer (EEA) and an ion bridge construction olefine copolymer (ionomer); PolystyreneAromatic vinyl copolymerssuch as a styrene butadiene copolymer; Polyvinyl chlorideVinylic halide polymerssuch as vinylidene chloride resin; An acrylonitrile styrene copolymerThe nitrile polymer like an acrylonitrile styrene butadiene copolymer; Nylon 6Nylon 66Paraor polyamide; polyethylene terephthalate like metaxylylene adipamidepolyester [such as polytetramethylene terephthalate]; -- several kinds -- thermoplasticssuch as polyacetalssuch as polycarbonate; polyoxymethylenecan be mentioned. Have not extended the plastics base material film which consists of such materialsor it is used as one axis or a film which carried out biaxial stretching.
[0015]A plastics base material film is laminated by other films via an anchor coat layer as occasion demandsand serves as a laminate film which constitutes a packaging bag. As a material which forms an anchor coat layerthe adhesive resin chosen from polyethyleneimine resinalkyl titanate resinpolyester isocyanate system resinurethane resinan epoxy resinetc. is used. There is no restriction in particular in the method of manufacturing the plastic laminate film used by this inventionIt can manufacture by the usual method forming a resin layer in the surfaces which paste together the film formed beforehandsuch as a metallic foilby coatingobtaining a laminate film simultaneously with formation of a film by co-extrusionetc.
[0016]As an example of a desirable laminate filmaluminium foil is made into an interlayer and what has a plastic film of at least one layer on the both sides is mentioned. The 3 layered films which consist of polyethylene terephthalate (PET) / aluminium foil / polypropylene (PP) as such a laminate filmfor exampleThe 4 layered films which consist of PET / aluminium foil / PET/PPand PET / aluminium foil / denaturation PP/PPthe 5 layered films which consist of PET / aluminium foil / denaturation PP / an ethylene propylene random copolymer / an ethylene propylene block copolymeretc. are mentioned. With these filmsgood PP film of heat-sealing nature is used as an inner surface sidethe spouts which connect a cell for a storage rear electrode terminala safety valveetc. are arrangedand PP film part is heat sealed and sealed. In using polyethylene system resin as

an innermost side of a packaging bagit uses polyethylene system resin as a spout raw material. Although the thickness of each film which constitutes a laminate film can be chosen suitablyby metallic foil layerssuch as 5-200 micrometers and aluminum5-50 micrometers shall usually be not less than 9 micrometers at a plastic film layerin order to avoid generating of a pinhole preferably.

[0017]An interior plastic container can also consist of this inventions by combining the above-mentioned box and the packaging bag made from a plastic laminate film. What is necessary is just to store the packaging bag of plastic lamination naturefor example inside a boxin order to constitute an interior plastic container with such a combination. An opening is selectively provided in the box used as an interior plastic containerand it is good for it also as wrap composition by a plastic laminate film in this opening so that drawing 7 may see.

[0018]When the armor can which consists of an existing sealing rigid materialand the interior plastic container arranged inside this armor can constitute the container for nonaqueous electrolyte batteries from this invention as mentioned aboveIt becomes possiblewhile improving water and gas barrier property to provide the stowage of a desiccant and/or a gas absorbent between an armor can and an interior plastic containerand it becomes possible to remove corrosive gassuch as the hydrogen fluoride gas emitted while removing moisture thoroughly. What was indicated previously can be used as these desiccants and gas absorbents. These desiccants and gas absorbents can use a powdered or granular thing for the Nakama opening of an armor can and an interior plastic container into remaining as it is or a nonwoven fabric bagputting it inor may form it in a sheet shaped using a carrierand may be inserted between an armor can and an interior plastic container. The packaging bag of the box which serves as an interior plastic container in these desiccants and gas absorbentsor the product made from a plastic laminate filmFor examplewater and gas barrier property can also be given to a container by scouring in memberssuch as an external layer and a cap which accompanies the spout for electrode terminal immobilizationthe spout for safety valve immobilizationand these which are heat sealed by the interior plastic container.

[0019]Although it follows on discharge and chargeand an electrode plate expands and contractsdistortion occurs and rechargeability falls between electrode plates in the rechargeable lithium-ion battery which laminated the electrode plate of many anodes and a negative electrode by turns via the separatorIn this inventionby making the container for cells into dual structureit becomes possible to provide the push press spring which presses an interior plastic container to an inner direction between an armor can and an interior plastic containerand distortion produced between electrode plates can be canceled. Elastic resin materialssuch as a flat spring which could use various kinds of spring materials as such a push press springfor examplewas formed in dishedrubberelastomer resinetc. can be used. Although it usually fixes to an armor can by adhesionmechanical adherenceetc.this push press spring is good for the direction which compresses the interval of the electrode plate stored in the interior plastic container within the battery container also as composition provided only in one side of a containerand good for it also as composition provided in the both sides of a container.

[0020]Bellows structure can be provided in an interior plastic container so that it may correspond to expansion of the electrode plate by discharge of a cell and chargeand contraction and a motion of a push press spring may be absorbed. This bellows structure

can be formed in the whole interior plastic container (when it is a packaging bag made from a plastic laminate film)and it may be made to form it in an interior plastic container selectively. (Refer to drawing 6)
An opening is selectively provided in the box used as an interior plastic containerand pliability is givenand it corresponds to expansion of an electrode plate and contractionand may be made to absorb a motion of a push press spring by covering this opening with a plastic laminate film. (Refer to drawing 7)
[0021]The layered product containing the outer layer which consists of rigid materials at least the multiple structure which serves as a container for cells as other gestalten of the container for nonaqueous electrolyte batteries of this invention so that drawing 8 may seeand the plastic layer containing a desiccant and/or a gas absorbent can constitute. Drawing 8 is a type section figure showing the package body for cellsand the numerals 31 express the package body for cellsthe outer layer where the numerals 32 consist of rigid materialsand the plastic layer in which the numerals 33 contain a desiccant and/or a gas absorbent in drawing 8.
[0022]As a rigid material which constitutes the outer layer 32the various surface treatment raw materials or the various resin coating raw materials of lightweight metal; these metalsuch as alloy; aluminumsuch as chromium of various metal materialsfor examplesteeland steel and nickeltitaniumor these alloysare mentioned. Polyethylene system resinsuch as high density polyethylenelow density polyethyleneand linear low density polyethyleneVarious polyolefinessuch as a polypropylene regin and cyclic polyolefinComposite materialssuch as fiber reinforced plastics which combined various plastic materialsuch as nylonpolyesterand crystalline polyesterand these plastic materialglass fibercarbon fiberetc.can also be used as a rigid material which constitutes an armor can.
[0023]Although there is no restriction in particular in the plastic material which constitutes the inner layer 33 and each thermoplastics usually used for manufacture of a plastic container can be usedAs desirable plastic materialpolyolefinessuch as high density polyethylene and polypropylenepolycarbonatepolyvinyl chloridepolyethylene terephthalateetc. are mentionedfor example. Into the plastic material which constitutes the inner layer 33the desiccant and/or gas absorbent which were indicated previously are blended by scour lump etc.
[0024]The principal member layer which consists of the above-mentioned plastic material in order to improve gas barrier propertyorganic solvent barrier naturemoisture barrier natureetc. although the inner layer 33 may be constituted as what has layer structurePolyamidesuch as an ethylene-vinylacetate copolymer saponification thingnylon 6and Nylon 66. It may constitute as what has the multilayer structure containing the gas-barrier-property resin layer of at least one layer which consists of polyacrylonitrile and its copolymera polyvinylidene chloride and its copolymerand cyclic polyolefin. When making the inner layer 33 into multilayer structurea desiccant and/or a gas absorbent can be blended with one layer or two or more layers of the resin layer which constitutes a inner layer. The heat-sealing nature resin layer 34 may be formed inside the inner layer 33 so that drawing 9 may seeand heat-sealing nature with the lid (not shown) which consists of the same material as the package body 31 for cellsetc. may be improved. Such multiple structure Blow moldingvacuum forminga vacuum and pressure formingan injection moldingIt can manufacture using an insertion injection molding and a press with

the usual forming processessuch as a diaphragm and cover-printing shaping by a metal plate etc.or these combinationand there is no restriction in particular in the forming process.

[0025]

[Example]Although an example explains this invention still in detail belowthese examples do not limit this invention.

(Production of a plastic laminate film) As laminationThe laminate film of biaxial extension PET (16 micrometers in thickness) / aluminium foil (15 micrometers in thickness) / maleic anhydride denaturation PP (5 micrometers in thickness) / ethylene propylene random copolymer (10 micrometers in thickness) / ethylene propylene block copolymer (90 micrometers in thickness) was manufactured in the following procedures. The aluminium foil layer of the two-layer film which carried out dry laminate of biaxial extension PET and the aluminium foil using urethane system adhesivesBetween the ethylene propylene block copolymer films used as the tapetum of an interior plastic container (packaging bag)Thickness the maleic anhydride denaturation PP and an ethylene propylene random copolymerrespectively 5 micrometersCarry out a co-extrusion and a sandwiches lamination is carried out so that it may be set to 10 micrometersIn order to perform sufficient adhesion between aluminium foil and denaturation polypropylene furthermorefusion heat treatment was performed so that it might become the temperature of 180 **finally the cure of urethane system adhesives was performed for four days at 55 **and the raw fabric film for packaging bag production used as an interior plastic container was obtained.

[0026](Production of the packaging bag used as an interior plastic container) The raw fabric film produced previously is sent out from the roll of a couple which carried out the slit to 48 cm in widthMake two sheets 5.5 cm of one side counter with a wraprespectivelyand both ends are heat sealed with a hot platen to a lengthwise directionit judgesafter carrying out pars-basilaris-ossis-occipitalis heat sealing in a transverse direction in pitch 48cm furthermoreand near inside dimension is 21 cm of original fabric cross directionits rectangular directions of 21 cmand 22 cm in height -- the cube-like gazette type packaging bag was produced mostly. As seal conditionssecure the seal width of each seal part and 22 mm The preset temperature of 220**10 ** of a hot platenThe transverse direction where sealing pressure 4.2**0.5kg/cm^2 and the lengthwise direction of two films have the portions of a cold plate and four films a 2 times hot platen and once pressed the cold plate a 3 times hot platen and twicerespectivelyand carried out the seal.

[0027](Assembly of an electrode) It used for $LiCoO_2$ as a positive pole collectorpolyvinylidene fluoride resin was used for the binder for natural graphite as a negative pole collectorrespectivelyand the charge collector was produced. Use a tabular thing (20 cm x 20 cm)respectivelyand as a separator 50 micrometers in thickness. The outer size method 20cmx20cmx20cm near electrode plate multiple system electrode unit around which it turned charge collector twist 1 for the prevention from a short circuit and which carried out a 700-set stack to the order of the positive pole collectorthe separatorand the negative pole collector as electrode plate number of sheets by turns using big PP fine porous membrane (21 cm x 21 cm) was assembled.

[0028]Electrode enclosure to the packaging bag which serves as an interior plastic container nextand the assembly of a cell are explained referring to drawings. Drawing 1

is a cross section of one example of the nonaqueous electrolyte battery which uses the battery container (dual structure container) which consists of multiple structure of this invention.
As for (A)(B) shows the state after laminated electrode unit insertion before laminated electrode unit insertion with the cross section which looked at the seal structure of the side of a packaging bag in which drawing 2 serves as an interior plastic container of the container for cells of this inventionfrom the upper surface.
Drawing 3 is a figure showing each member before the assembly which constitutes the nonaqueous electrolyte battery which uses the container for cells of this invention.
[0029]In these figuresa cell and the numerals 2 express the O ring in which the numerals 1 fix the packaging bag made from a plastic laminate filmthe numerals 4 fix an armor can lidandas for an armor can and the numerals 3the numerals 5 fix the main part 2 of an armor canand the lid 4. The dished push press spring which presses the packaging bag 3 in which the numerals 6 stored the laminated electrode plateand the numerals 7 express a positive electrode boardthe numerals 8 express a negative pole electrode boardand the numerals 9 express a separator. And as for the numerals 11the spout for electrode terminal immobilization and the numerals 12 express the spout for safety valve immobilizationthe numerals 13 express an O ringand the numerals 14 express an O ring fixing cap.
[0030](Electrode enclosure to a packaging bag) After extending the gazette type packaging bag 3 which produced previously the electrode unit assembled previously in the shape of a cubeit inserts (refer to drawing 2)and each terminal which came out from the charge collector is bundledand the screw stop of this is further carried out to a copper cylindrical electrode terminal. It fixed to the anode by the injection molding which produced this electrode terminal in order to heat seal with packaging bag inner surface resina negative pole terminaland the spouts 11 and 12 for safety valve immobilization via O ring 13 made of a fluoro-resin (trade name Viton). Subsequentlyafter inserting the open end of the gazette type packaging bag 3 into predetermined shapethe spouts 11 and 12 are heat sealed in the two-sheet portion of the film of an end with the heat seal bar set by spout shape. The portion of four films performed sufficient heat sealing separately. Subsequentlyin order to restore to the original gap when inter electrode distance is extended at the time of a repetition of charge and discharge so that the side attachment wall of the armor can 2 may be countered on the side of the packaging bag 3the dished push press spring 6 for putting back a laminated electrode unit more nearly vertically than a lamination side is attached. The anode projected from the packaging bag 3a negative pole terminaland the spouts 11 and 12 for safety valve immobilization carry out seal immobilization with the armor can lid 4 with the cap form part 14 which formed the thread part via O ring 13 made of a fluoro-resinrespectively. Furthermorethe armor can lid 4 carries out seal immobilization via O ring 5 made of a fluoro-resin in the flange of an armor can. Such assembly operation is carried out in protection against dust and the drying room of less than 10% of relative humidity.
[0031](Pouring of an electrolysis solution) After repeating the operation which carries out vacuum suction of the inside of a containerand is further replaced with bone-dry nitrogen 3 timesas an electrolysis solutionTo the organic solvent of the mixture ratio 7/3 which consists of ethyl carbonate (EC) / diethyl carbonate (DEC) adjusted to less than 20 ppmwater content. The cap seal of this was poured in and carried out from the safety

valve 12 using the organic electrolysis liquid which dissolved $LiPF_6$ by the concentration of 1 mol/l. as an electrolyte.
[0032]Nextthe container for cells which has various composition was producedand the comparative examination was attached and carried outwithout whether the safety of a container being enough in whether the charging and discharging characteristic stable when the composition of a container carried out repetition charge and discharge battery capacityespecially for a long period of time is secured.
(Example 1) 3 mm in thickness which carried out multistage-deep-drawing processing of the aluminum materialand an inside dimension method constituted the container for cells of drawing 1 from 22 cm longthe side of 22 cmand a depth of 22 cm combining the armor can of the corner part 10Rand the packaging bag made from a plastic laminate film produced previously. Between the armor can 2 and the packaging bag 3the push press spring 6 which presses a packaging bag from one side was formed.
[0033](Example 2) Minimum 6 mm in thickness which carried out the injection molding of the polypropyleneand an inside dimension method constituted the container for cells of drawing 1 from 22 cm longthe side of 22 cmand a depth of 22 cm combining the armor can of the corner part 10Rand the packaging bag made from a plastic laminate film produced previously. Between the armor can 2 and the packaging bag 3the push press spring 6 which presses a packaging bag from one side was formed.
[0034](Comparative examples 1-4) 5 mm in thickness which carried out multistage-deep-drawing processing of the steel lumber for comparison. That for which an inside dimension method uses the container and cover material of the corner part 10R independently in 21 cm longthe side of 21 cmand a depth of 21 cm (comparative example 1)Minimum 6 mm in thicknessand the inside dimension method which carried out the injection molding polypropylene 21 cm long. 21 cm widethe thing which uses the container and cover material of the corner part 10R independently in a depth of 21 cm (comparative example 2)What uses independently the packaging bag made from a plastic laminate film produced previously (comparative example 3)what provided the 2-mm-thick aluminum material panel in the outside of the packaging bag made from a plastic laminate film produced previously as a protective layer of a packaging bag at the flankthe pars basilaris ossis occipitalisand the covering device (comparative example 4) -- the container for cells was constituted as be alike. It is a thing of composition of differing which uses the armor can which the packaging bag is open for free passage with the open air with the container of the comparative example 4and has the sealing performance of this invention.
[0035](Charge-and-discharge service test) In the container of these each examplean electrode unit is sealed hermetically as mentioned abovethe continuous operation examination which repeats charge and discharge at a room temperature is carried outand the result of having evaluated battery capacity is shown in Table 1. The maintenance factor (%) to the initial value of the electromotive force after carrying out continuous operation of the efficiency maintenance factor in Table 1 on the 200th and repeating charge and discharge is expressedand electromotive force will express electromotive force (V/kg) per cell unit weight after continuous operation on the 200th.
[0036]
[Table 1]

[0037]Although the efficiency maintenance factor is good to some extentsince weight becomes heavythe electromotive force per cell unit weight of what used independently metal materialssuch as steel by which the conventional proposal is made (comparative example 1) is low according to this result. In order for the corrosion of a surface of metal and degradation of an electrolysis solution to arise in order that a metal material may contact an electrolysis solution directlyand to guarantee the stable use over several yearswhile an expensive alloy and a surface treatment are neededit becomes disadvantageous also in respect of reuse of a container. Although what used plastic material independently (comparative example 2) is excellent in respect of the weight saving and intensity of a cellsince its penetration of the moisture which the GASUBARIA nature of the plastic itself has a limit and promotes decomposition and degradation of an electrolysis solution especially is largeits charge performance degradation accompanying decomposition and degradation of an electrolysis solution is remarkable.
[0038]What used the aluminum laminate film independently (comparative example 3)Even if it uses the thing of lamination composition which was excellent in intensity how muchit is not avoided that a pinhole occurs at the time of an assembly of a battery containerWhen it is more nearly needlelike than the exterior and pokesa container is damagedand there is a problem in the safety of an isochore machine with a possibility of causing the ignition which is a critical defect of this kind of cell. In order to recover an inter-electrode gap in this caseit becomes impossible theoretically to provide a push press spring etc. In the thing of the comparative example 4 adopted by these kinds for [conventional] mobile communications etc. of cellsince invasion of the moisture from the seal edge of an aluminum laminationetc. cannot be disregarded but there is generating of the corrosive gas accompanying degradation of an electrolysis solutioncorrosion arises in an aluminum panel surface and prolonged stable use is difficult.
[0039]On the other handin Examples 1 and 2 of this invention using the double sealing structure container of an armor can and an aluminum laminated package bagthe battery characteristic which has practicality in any case was obtained. When there is decline in some charging efficiency at the time of continuous operation when an armor can is a plasticand considering longer-term stable usemetal armor cans are preferred. Since the rate of the weight of the electrode unit and electrolysis solution which are occupied in the weight of the whole cell is largeit is advantageous from pointssuch as mitigation of total weightand reuse of an armor canto use the aluminum which has the minimum thickness which is sufficient for protecting a packaging bag by closing in comparativelyand a titanium material.
[0040]In addition to the container specification for cells of Example 1the desiccant and/or the gas absorbent were used with various gestaltenand the following examples estimated these influences it has on a cell function.
(Example 3) Two bags (numerals 21 of drawing 4) of nonwoven fabric bags which carried out the silica gel 50g as a desiccantand carried out mixed filling of the permutite 50g to the armor can of the container for cells of Example 1 and the opening of the packaging bag as a gas absorbent have been arranged.
[0041](Example 4) As an ethylene propylene block copolymer film which serves as tapetum which constitutes a packaging bag in the container for cells of Example 1The

copolymer film which scoured 1% of the weight of the synthetic hydrotalciteand carried out lump contentand the two-layer film which comprises an additive-free copolymer film were used as a gas absorbent which occupies this 70% of thicknessand the packaging bag was constituted so that an additive-free layer might serve as a heat-sealing side.
[0042](Example 5) In the container for cells of Example 1what scoured 3% of the weight of permutite to PP system resinand carried out the injection molding to it was used as the spout for electrode terminal immobilizationand a spout for safety valve immobilization.
[0043](Example 6) The laminate film of PET (15 micrometers in thickness) / LLDPE (50 micrometers in thickness) / aluminium foil (20 micrometers in thickness) / PET (25 micrometers in thickness) / PP (70 micrometers in thickness) constituted the packaging bag of the container for cells of Example 1. As a LLDPE filmwhat scoured beforehand 1 % of the weight of synthetic hydrotalcites and 1 % of the weight of permutiteand produced the film was used.
[0044](Example 7) Two bags of nonwoven fabric bags which carried out the silica gel 50g as a desiccantand carried out mixed filling of the permutite 50g to the armor can of the container for cells of Example 1 and the opening of the packaging bag as a gas absorbentand a tabular nickel series hydrogen absorption sintered compact with a weight of about 100 g have been arranged.
[0045]While sealing an electrode unit hermetically like the above-mentioned Examples 1 and 2 in the container for cells obtained in these Examples 3-7carrying out the continuous operation examination which repeats charge and discharge for one year at a room temperature and evaluating an efficiency maintenance factorGenerating of the gas accompanying decomposition and degradation of the charge collector and electrolysis solution by continuous use etc. were evaluated. The gas analysis of the armor can building envelope extracted the gas in space in the micro syringeand analyzed gas composition with gas chromatography. The Karl Fischer technique estimated the moisture regain of the electrolysis solutionand the titrimetric method estimated the amount of fluoric acid. These results were collectively shown in Table 2. In Table 2an efficiency maintenance factor expresses the maintenance factor (%) to the initial value of the electromotive force after carrying out continuous operation for one year and repeating charge and discharge.
[0046]
[Table 2]

[0047]In addition to the double sealing structure of an armor can and a packaging bagfrom these resultsby using the various desiccants and/or gas absorbents of a gestalt shows that removal of moisture and the exclusion function of gas can be given and much more stable protraction of a battery life can be attained by this invention. When the moisture content in an electrolysis solution serves as an index for predicting a long-term battery lifeit is desirable to maintain to 20 ppm or less generally and it gives a water absorption function to the container for cells by the method of one of the aboveIt is farther [than this marginal level] maintainable to lower order (especially Example 3).
[0048]It produces by disassembly of an electrolysis solution by using a hydrotalcite etc.and the trap of the fluoric acid which corrodes a container member becomes possible (especially Example 4). And the cracked gas ingredients (carbon

monoxideethyleneacetyleneetc.) of the electrolysis solution by which it is generated in very small quantities by prolonged charge and discharge by using a molecular sieve etc. in addition to removal of moisture can also be removedandin addition to the function of a cellsafety can also be improved (examples 35and 6). The trap also of the hydrogen generated in very small quantities by charge and discharge can be thoroughly carried out by adopting dual structure (especially Example 7). As shown in these examplesby independent sealing structureit will not understand that it can aim at improvement in battery capacitysafetyetc. which cannot be attained without adopting the dual structure of an armor can and a packaging bagrespectively.

[0049]Drawing 5 is a figure showing other examples of the container for nonaqueous electrolyte batteries of this invention.

It is a mimetic diagram showing each member before the assembly which constitutes the container for cells.

In drawing 5the box of the product [numerals / 23] made from a plastic and the numerals 24 express an armor can lidthe numerals 25 express a frameand other numerals express drawing 1 - the same member as four. In this examplethe box 23 made from a plastic is used as an interior plastic container which stores the electrode plate module which constitutes a nonaqueous electrolyte battery. The box 23 made from a plastic which stored the electrode plate module is arranged in the armor can 2 which consists of rigid materials. On the box 23the armor can lid 24 made from a plastic which formed the spout 11 for electrode terminal immobilization and the spout 12 for safety valve immobilization in oneO ring 5 made of a fluoro-resinand the frame 25 are laid one by oneand it is fixed to one with O ring 13 and the O ring clamping cap 14 made of a fluoro-resin.

[0050]In the following examplesthe armor can made from aluminum which has the same composition as Example 1 was used as the armor can 2 in drawing 5the box 23 made from a plastic was produced with various molding methodsthe cell was assembledand the quality assessment was performed.

(Example 8) As an interior plastic containerthe blow molding object of 0.8 mm of average wall thickness which comprises the two-sort two-layer of high density polyethylene (HDPE)/linear low density polyethylene (LLDPE) is produced from an outer layerThe opening for inserting an electrode plate module was provided in the upper partthermoforming of the flange for subsequently carrying out the seal of the lid was carried out so that LLDPE of a inner layer might serve as a sealing surface with a lidand the with the inside dimension of 21 cm x 21 cm and a depth of 21 cm box made from a plastic was produced. The lid which has two spouts for electrode terminal immobilization with a minimum thickness of 2 mm and one spout for safety valve immobilization was produced by the injection moldingusing high density polyethylene as a lidand the container for cells of drawing 5 was constituted. In this examplethe electrode module was perpendicularly pressed down with metal springs from the exterior of the interior plastic container.

[0051](Example 9) In the container of Example 8what enclosed a hydrotalcite and 50g of molecular sieves 13X with the small bag which becomes the Nakama opening of an armor can and an interior plastic container from a fine porosity breathable filmrespectively has been arranged. In this examplethe electrode module was perpendicularly pressed down with metal springs from the exterior of the interior plastic

container.
[0052](Example 10) As an interior plastic containerFrom the outsidethe high density of the high density polyethylene / linear polyethylene system maleic anhydride modified resin / cyclic polyolefin (glass transition temperature of 85 **) / linear polyethylene system maleic anhydride modified resin / hydrotalcite 5000ppm content of hydrotalcite 5000ppm content. The blow molding object of 0.8 mm of average wall thickness which consists of three sorts of five layers of polyethylene was producedthe opening for inserting an electrode plate module in the upper part was providedthermoforming of the flange for subsequently carrying out the seal of the lid was carried outand the with the inside dimension of 21 cm x 21 cm and a depth of 21 cm box made from a plastic was produced. As a lidthe lid made from high density polyethylene of the hydrotalcite 5000ppm content which has two spouts for electrode terminal immobilization with a minimum thickness of 2 mm and one spout for safety valve immobilization was produced by the injection moldingand the container for cells of drawing 5 was constituted.
[0053](Example 11) As an interior plastic containerfrom the outsidethe molecular sieve 13XBlock polypropylene / maleic anhydride modified polypropylene / ethylene content% of 4 mol of 3000 ppm content of ethylene content% of 32 mol of an ethylene-vinyl acetate copolymer saponification thing / maleic anhydride modified polypropylene / molecular sieve 13XThe with the inside dimension of 21 cm x 21 cm and a depth of 21 cm collar-head cup like container was produced by a vacuum and pressure forming from the sheet which consists of three sorts of five layers of ethylene content% of block polypropylene of 4 mol of 3000 ppm content. As a lidthe lid made from polypropylene of the hydrotalcite 5000ppm content which has two spouts for electrode terminal immobilization with a minimum thickness of 2 mm and one spout for safety valve immobilization was produced by the injection moldingand the container for cells of drawing 5 was constituted.
[0054](Example 12) As an interior plastic containerthe molecular sieve 13XEthylene content% of random polypropylene containing ethylene content% of 4 mol of 3000 ppm content of block polypropylene / maleic anhydride modified polypropylene / nylon 6 / incomparable maleic acid denaturation polypropylene / hydrotalcites of 7 mol. [3000 ppm of] The with the inside dimension of 21 cm x 21 cm and a depth of 21 cm collar-head cup like container which consists of three sorts of five layers was produced by the multilayer injection molding so that it might become ******. As a lidthe lid made from polypropylene of the hydrotalcite 5000ppm content which has two spouts for electrode terminal immobilization with a minimum thickness of 2 mm and one spout for safety valve immobilization was produced by the injection moldingand the container for cells of drawing 5 was constituted.
[0055](Example 13) The cup like container produced from the multilayered sheet by carrying out a vacuum and pressure forming like Example 11 was produced. From the exterior of the interior plastic container 23 which formed the processing section 26 of bellows shape by thermoforming so that the portion which hits the both side surfaces of the electrode module of this container might see at drawing 6. The press of an electrode module to a perpendicular direction was enabled with metal springsand also the container for cells was produced like Example 11.
[0056](Example 14) In the multilayer injection molding of Example 12the metallic mold was corrected and the cup like container was produced so that an opening with a square

of 15 cm x 15 cm might be provided in the portion which hits the both side surfaces of the electrode module of a container. The laminate film (17 cm x 17 cm) 28 of composition of becoming the outside of this opening from PET (25 micrometers) / aluminum foil (30 micrometers) / PET (25 micrometers) / block PP film (90 micrometers) so that drawing 7 may see from the armor can side is heat sealedrespectivelyThe interior plastic container 23 was produced. Other composition produced the container for cells like Example 12.
[0057]The container for cells obtained in above-mentioned Examples 8-14 was usedthe electrode unit assembled previously was enclosedand after filling up with and sealing the electrolysis solution and assembling a cellthe battery capacity after continuous operation was evaluated like the previous example for one year. A result is shown in Table 3.
[0058]
[Table 3]

[0059]In Table 3the full weight of the container member for cells is expressed with the column of weight to the upper rowand the inside of lower-berth () expresses cell gross weight with it. An efficiency maintenance factor expresses the maintenance factor to the initial value of the electromotive force after carrying out continuous operation of the cell for one year and repeating charge and dischargeand electromotive force expresses the electromotive force per cell unit weight after continuous operation for one year. By these cellsby having carried out the weight saving of the whole containerthe electromotive force per cell unit weight after continuous operation becomes high for one yearand an efficiency maintenance factor hardly fallseither. By blending a gas absorbent into a container componentor arranging a gas absorbent in a battery containerthe stability of an electrolysis solution is maintained and the long maintenance of the performance of a cell becomes possible. The higher voltage to stability is obtained by attaching metal springs to the exterior of an inner package container.
[0060]Although each above-mentioned example explained the example which applied this invention to the rechargeable lithium-ion batteryIt cannot be overemphasized that this invention is applicable to the other nonaqueous electrolyte batteries with which it is required of the same container performancessuch as reduction of the deterioration prevention of an electrolysis solutiongenerating gasetc.for examplea sodium-sulfur batterythe cell of various kinds of polymer electrolyte useetc. As for this inventionit is needless to say that various composition can be taken in addition to thiswithout not being restricted to the above-mentioned example and deviating from the gist of this invention.
[0061]
[Effect of the Invention]While a little the moisture and the gas emitted in a cell are absorbable according to this inventionThe fall of the rechargeability by generating of the distortion accompanying expansion of the electrode in the case of discharge and charge and contraction can be preventedand the container for cells which enables manufacture of nonaqueous electrolyte batteriessuch as a mass large-sized rechargeable lithium-ion batterycan be obtained. By using the container for cells of this inventionmanufacture of nonaqueous electrolyte batteriessuch as a rechargeable lithium-ion battery which is equal to use for about five yearsis attained. While realizing the weight saving of a cell by making the container for cells of this invention into the double sealing structure which

consists of an armor can which consists of rigid materialsand an interior plastic containerAfter duration of service passesby exchanging the interior plastic container containing a cell properit becomes possible to reuse an armor canand discharge of waste is decreasedit contributes also to saving resourcesand practical value is high.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1]It is a type section figure showing one example of the nonaqueous electrolyte battery which uses the container for cells of this invention.
[Drawing 2]It is the type section figure which looked at the packaging bag used as the interior plastic container of the container for cells of this invention from the upper surfaceandas for (A)(B) shows the state after laminated electrode unit insertion before laminated electrode unit insertion.
[Drawing 3]It is a mimetic diagram showing each member before the assembly which constitutes the nonaqueous electrolyte battery which uses the container for cells of this invention.
[Drawing 4]It is a type section figure showing other examples of the nonaqueous electrolyte battery which uses the container for cells of this invention.
[Drawing 5]It is a figure showing other examples of the container for cells of this inventionand is a mimetic diagram showing each member before an assembly.
[Drawing 6]It is a figure showing other examples of the interior plastic container which constitutes the container for cells of this invention.
[Drawing 7]It is a figure showing other examples of the interior plastic container which constitutes the container for cells of this invention.
[Drawing 8]It is a type section figure showing other examples of the container for cells of this invention.
[Drawing 9]It is a type section figure showing other examples of the container for cells of this invention.
[Description of Notations]
1 Cell
2 Armor can
3 The packaging bag made from a plastic laminate film
4 and 24 Armor can lid
513 O rings
6 Push press spring
7 Positive electrode board
8 Negative pole electrode board
9 Separator
11 The spout for electrode terminal immobilization
12 The spout for safety valve immobilization
14 O ring clamping cap
21 Nonwoven fabric bag
23 The box made from a plastic
25 Frame

31 The package body for cells
32 The outer layer which consists of rigid materials
33 Absorbent content plastic layer
34 Heat-sealing nature resin layer